WORK DONE BY A CONSTANT FORCE

a) The work done by a constant force in moving an object is equal to the product of the force on the object over the distance the force is exerted on the object.

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$$W = F \times d \quad \text{or with an angle} \quad W = F \times d \cos\theta$$

unit is Joule (cool)

Work is a scalar quantity thus the angle or direction of the work done is not important as in vector quantities. In the British system the foot-pound is the unit

1) A tractor exerts a constant force of 5.0 x 10^3 N on a horizontal chain while moving a load a horizontal distance of 3.0 x 10^6 cm. How much work was done by the tractor? $(5\times10^3)(3\times10^4) = 1.5\times10^8$ J

2) A crane lifts a 2.0 metric ton (1 metric ton = 1000kg) and a vertical distance of 15.0 m. The speed of the load is constant, how much work is done in lifting it ? $(10{,}2000(15) = 300000$ J

3) A student holds her psychology textbook, mass = 1.5 kg, out of a second story window until her arm is tired, and then releases it. a) how much work is done on the book by the student in simply holding it out the window? b) how much work will have been done by the force of gravity during the time in which the book falls 3.0 m?   a) 0 J   b) $1.5(3) = 4.5$ J
W

4) If a person pushes on the lawn mower with a constant force of 90 N at an angle of 40 ° to the horizontal, how much work does she do in pushing it a horizontal distance of 7.5 m.? $90(7.5)(\cos(40)) = 517.1$ J

5) A 7.5 kg block slides down a 20° incline plane (length = 1.27 m) with a uniform velocity. a) how much work is done by the force of friction on the block as it slides the total length of the plane? b) what is the net work done on the block? c) discuss the net work done if the angle of incline is adjusted so that the block accelerates down the plane?

a) $7.5 \times 10 = 75$ N

$-75\sin(20) = -25.6$

Work done $= 25.6 \cdot (1.27)$

$= -32.58$ J
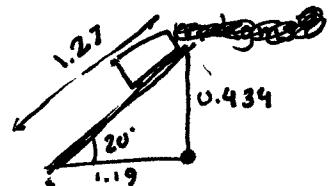
b) u=mgh = $7.5(10)(0.434) = 32.55$ J

c) It will increase.